

## CLAIMS

What is claimed is:

1. A computer-implemented method for pricing a financial derivative of a non-marketed variable  $x_e$ , the method comprising:

a) determining a market representative  $x_m$  useful in determining a value of the financial derivative;

b) retrieving information associated with the non-marketed variable  $x_e$  and the market representative  $x_m$ ;

c) calculating a solution to an equation involving a price of the financial derivative  $V(x_e, t)$  defined as a function of  $x_e$  and time  $t$ , wherein the equation comprises a coefficient involving the information associated with  $x_e$  and  $x_m$ ;

and

d) generating an output including the calculated price of the financial derivative.

2. The method of claim 1 wherein the information associated with  $x_e$  and  $x_m$  comprises a drift rate of the non-marketed variable  $x_e$ , and a drift rate of the market representative  $x_m$ .

3. The method of claim 1 wherein the information associated with  $x_e$  and  $x_m$  comprises variances of the non-marketed variable  $x_e$  and the market representative  $x_m$ , and a covariance between the non-marketed variable  $x_e$  and the market representative  $x_m$ .

4. The method of claim 1 wherein the coefficient involving the information associated

with  $x_e$  and  $x_m$  has the form  $\mu_e - \beta_{em}(\mu_m - r)$ , where  $\mu_e$  is a drift rate of the non-marketed variable  $x_e$ ,  $\mu_m$  is a drift rate of the market representative  $x_m$ ,  $r$  is an interest rate, and  $\beta_{em}$  is a factor derived from a variance of the market representative  $x_m$  and a covariance between the non-marketed variable  $x_e$  and the market representative  $x_m$ .

5. The method of claim 1 wherein the equation is a modified Black-Scholes equation.

6. The method of claim 5 wherein the modified Black-Scholes equation is obtained from a standard Black-Scholes equation by replacing, in a term involving a first-order partial derivative of  $V(x_e, t)$  with respect to  $x_e$ , a coefficient  $r$ , representing an interest rate, by a coefficient involving the information associated with  $x_e$  and  $x_m$ .

7. The method of claim 1 wherein the equation is a discrete-time equation involving  $V(x_e, t)$  defined as a function of  $x_e$  and discrete time points  $t = k$ .

8. The method of claim 1 wherein the market representative  $x_m$  comprises a marketed asset or combination of such assets that is approximately most correlated with the non-marketed variable  $x_e$ .

9. The method of claim 1 wherein the market representative  $x_m$  comprises a combination of multiple marketed assets associated with market sectors most closely associated with the non-marketed variable  $x_e$ .

10. The method of claim 1 wherein the market representative  $x_m$  comprises a marketed asset or combination of such assets that is approximately equal to an overall market portfolio.

11. The method of claim 1 further comprising calculating an optimal hedge.
12. The method of claim 1 further comprising calculating a minimum variance of the error between an optimal hedge and the calculated price of the financial derivative.
13. The method of claim 1 wherein the equation represents a risk-neutral discounted expected value of cash flows of the financial derivative.
14. The method of claim 13 wherein a cash flow of the financial derivative is path-dependent.
15. The method of claim 1 applied to derivatives of a set of non-marketed variables wherein the market representative  $x_m$  comprises a combination of multiple marketed assets, each most-correlated with a different non-marketed variable in the set of non-marketed variables.
16. The method of claim 1 wherein the calculated price of the financial derivative includes cash flows at an intermediate time and a terminal time.
17. The method of claim 1 wherein drift rates, an interest rate, variances, and covariances of  $x_e$  and  $x_m$  either vary with time or are governed by stochastic processes.
18. The method of claim 1 wherein the cash flow depends on marketed variables as well as non-marketed variables.
19. The method of claim 1 wherein the equation involves additional non-marketed vari-

ables.

20. The method of claim 1 wherein the market representative is derived from a combination of multiple marketed variables, and wherein  $x_e$  and the multiple marketed variables are governed by either geometric Brownian motion or alternative processes.

21. A computer-implemented method of pricing a financial derivative of a non-marketed finite-state variable  $B$ , the method comprising:

a) determining a market representative  $A$  associated with the non-marketed finite-state variable  $B$ ;

b) calculating risk-neutral probabilities for the non-marketed finite-state variable  $B$  using a binomial lattice model associated with the non-marketed finite-state variable  $B$  and the market representative  $A$ ;

c) calculating values of a price function  $V$  defined on the lattice corresponding to the variable  $B$ ;

and

d) generating from the calculated values of the price function  $V$  an output including a calculated price of the financial derivative.

22. The method of claim 21 wherein the market representative  $A$  is determined to be approximately equal to at least one of a Markowitz portfolio, a market portfolio, and a market asset most correlated to the non-marketed finite-state variable  $B$ .

23. The method of claim 21 further comprising calculating an optimal hedge.

24. The method of claim 21 further comprising calculating a minimum variance of the error between an optimal hedge and the calculated price of the financial derivative.

25. The method of claim 21 wherein a cash flow of the financial derivative is path-dependent.

26. The method of claim 21 wherein the binomial lattice model comprises time-dependent lattice parameters of the variables  $A$  and  $B$ .